claims 4 and 30 have been written in independent form, incorporating the aforementioned amendment, so as to overcome the rejection under 35 U.S.C. §112, second paragraph.

Additionally, by the present amendment, claim 1 has been amended to recite applying an rf bias voltage of a frequency of at least 100 kHz as illustrated in Fig. 4 of the drawings, for example. Also, new dependent claims 31-33 have been presented, reciting the feature that no rf bias voltage is applied during the off state of the on-off modulating of the rf bias voltage (claim 33), that the sample has a first layer formed over a second layer which underlies the first layer, and the anisotropic etching treatment is an anisotropic main etch of the first layer which is prior to the another period during which the second layer which underlies the first layer is exposed (claim 31), and that anisotropic main etch is effected of the first layer during the at least one period without exposing the second layer (claim 32).

Applicants note that in the Office Action of March 11, 2003, the Examiner did not act upon claim 4 which is pending in this application, and therefore, claim 4 is considered to be allowable and has been written in independent form incorporating the features of claim 1 therein, which claim has been amended to delete the term "high" and thereby overcome the apparent rejection under 35 U.S.C. §112, second paragraph. Applicants note that claim 4 recites the duty ratio of the rf bias voltage in the on state is set to 5 to 50% which, as apparently recognized by the Examiner, is not disclosed in the cited art.

With regard to the rejection of claim 30 under 35 U.S.C. §112, first paragraph, this rejection is traversed, and reconsideration and withdrawal of the rejection are respectfully requested.

Applicants submit that the Examiner has misinterpreted the language of claim 30 which, when properly interpreted, provides that the number of ions at the at least one peak point of the high ion energy region and the low energy region is at least

twice a number of ions at the at least one peak point in the intermediate ion energy region, which is clearly illustrated in Fig. 4 of the drawings of this application. Thus, the Examiner's reference to the area represented by the total number of ions contained under the curve of Fig. 4 in the high energy region and the low energy region with respect to that of the intermediate energy region does not relate to the claimed features. That is, claim 30 is directed to the number of ions at a single peak point in each of the high ion energy region and the low ion energy region as compared with the number of ions at a single peak point in the intermediate ion energy region, which is clearly illustrated in Fig. 4 of the drawings of this application, and such claim is not directed to the total number of ions within the energy regions as represented by the area under the curve. Accordingly, applicants submit that claim 30 is in compliance with 35 U.S.C. §112, first paragraph, and since claim 30 has not been rejected over the cited art, and in light of the amendment to delete "high", applicants submit that claim 30 should now be in condition for allowance.

As to the rejection of claims 1 and 24-29 under 35 U.S.C. 102(b) as being anticipated by US 5,352,324 issued to Gotoh et al, this rejection is traversed insofar as it is applicable to the present claims, and reconsideration and withdrawal of the rejection are respectfully requested.

At the outset, as to the requirements to support a rejection under 35 U.S.C. 102, reference is made to the decision of In re Robertson, 49 USPQ 2d 1949 (Fed. Cir. 1999), wherein the court pointed out that anticipation under 35 U.S.C. §102 requires that each and every element as set forth in the claim is found, either expressly or inherently described in a single prior art reference. As noted by the court, if the prior art reference does not expressly set forth a particular element of the claim, that reference still may anticipate if the element is "inherent" in its disclosure. To establish inherency, the extrinsic evidence "must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and

that it would be so recognized by persons of ordinary skill." Moreover, the court pointed out that inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.

Turning to claim 1, as amended, such claim has been amended to recite applying an rf bias voltage of a frequency of at least 100 kHz which feature is not disclosed or taught by Gotoh et al. While the Examiner indicates that col. 8, line 12 of this patent, indicates a radio frequency power of 1 kHz or more, Gotoh et al does not provide a disclosure in the sense of 35 U.S.C. 102 of the minimum frequency of 100 kHz, nor can it be considered obvious in the sense of 35 U.S.C. 103 to provide a teaching of such minimum frequency in light of the disclosed minimum frequency of 1 kHz of Gotoh et al, which does not provide the features of the present invention. Thus, hereagain, while the Examiner recognizes that claim 1 requires the peak-to-peak voltage of the modulated bias power to be set to a level such that the etching rate that is obtained with a modulated bias power is equal to the etching rate that is obtained with the continuous application of the smaller peak-to-peak voltage bias power, the Examiner has not provided any proper factual basis to support such "inherency" argument, especially in light of the requirement of an rf bias voltage frequency of at least 100 kHz. Thus, claim 1, as amended, patentably distinguishes over Gotoh et al in the sense of 35 U.S.C. 102 and 35 U.S.C. 103, irrespective of the Examiner's position with respect thereto.

As to the newly added dependent claims, applicants note that such claims define the feature of the sample having at least a first layer overlying a second layer which may be considered to be represented by the layer 503 overlying the layer 502 as illustrated in Fig. 16 of the drawings of this application, and as described at pages 24 and 25 of the specification. More particularly, as indicated at page 24, lines 15 et. seq., step 2 relates to the etching of the polysilicon 503 as a main part of the process

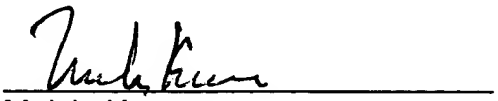
and the etching is referred to as a "main etch" hereinbelow, wherein profile control or anisotropic etching is important. As described, the rf bias power supply 109 is on-off modulated in step 2, wherein, as shown in Fig. 16(c), after completion of step 2, the layer 503 is etched by the on-off modulation without exposing the layer 502 and subsequent etching with a higher selectivity than that obtained during the on-off modulation of the main etch is effected and results in exposure of the layer 502. Thus, it is apparent that proper basis is provided in the specification at page 24 for the terminology of "main etch" as now utilized in the dependent claims, and additionally, while the Examiner refers to Fig. 9 of Gotoh et al and col. 10, line 59 to col. 11, line 3, it is noted that Fig. 9 does not disclose on-off modulation, but rather switching between a first radio frequency bias value and a second ratio frequency bias value and what the Examiner contends achieve different selectivity does not occur in accordance with the claimed features of this application. It is apparent that as shown in the just-etching and over-etching, etching of both of the nitride and oxide layers is achieved during the switching of the different bias values of rf power and it apparent that Gotoh et al does not disclose or teach the claimed features as set forth in independent claim 1 and the dependent claims 31-33 thereof, in which the underlying layer is not exposed. Accordingly, applicants submit that these claims patentably distinguish over Gotoh et al and should now be in condition for allowance.

In view of the above amendments and remarks, applicants submit that all claims present in this application should now be considered to be in compliance with 35 U.S.C. §112, first and second paragraphs, and that all claims patentably distinguish over the cited art and should now be in condition for allowance. Accordingly, issuance of an action of a favorable nature is courteously solicited.

To the extent necessary, applicant's petition for an extension of time under 37 CFR 1.136. Please charge any shortage in the fees due in connection with the filing

of this paper, including extension of time fees, to Deposit Account No. 01-2135 (520.36911CX2) and please credit any excess fees to such deposit account.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Please amend claim 1 as follows:

1. (four times amended) A method of treating a surface of a sample, comprising the steps of:

generating a plasma in a treatment chamber;

applying an rf bias voltage of a frequency of at least 100 kHz so that ions of intermediate energy which promote etching reaction while providing poor directionality are reduced, and ions of high energy having a high directionality and ions of low energy which do not contribute to etching are increased, so as to have at least one peak point at a region of high ion energy and at least one peak point at a region of low ion energy for anisotropic etching, and the rf bias voltage to which a peak to peak voltage Vpp value larger than a Vpp value of a continuous rf bias voltage at which the same etch rate can be obtained is given, so as to have the high ion energy which is larger than a high ion energy of the continuous rf bias voltage, is applied to a stage on which a sample is placed independently of the generation of the plasma; and

on-off modulating the rf bias voltage at least at one period of anisotropic etching treatment of the sample ~~in which anisotropy is high~~ and which is prior to another period of etching treatment of the surface of the sample in which selectivity is higher than selectivity at the one period.

Please rewrite claim 4 in independent form as follows:

4. (amended) A method ~~according to claim 1,~~ of treating a surface of a sample, comprising the steps of:

generating a plasma in a treatment chamber;

applying an rf bias voltage of a frequency so that ions of intermediate energy which promote etching reaction while providing poor directionality are reduced, and ions of high energy having a high directionality and ions of low energy which do not contribute to etching are increased, so as to have at least one peak point at a region of high ion energy and at least one peak point at a region of low ion energy for anisotropic etching, and the rf bias voltage to which a peak to peak voltage Vpp value larger than a Vpp value of a continuous rf bias voltage at which the same etch rate can be obtained is given, so as to have the high ion energy which is larger than a high ion energy of the continuous rf bias voltage, is applied to a stage on which a sample is placed independently of the generation of the plasma; and

on-off modulating the rf bias voltage at least at one period of anisotropic etching treatment of a surface of the sample and which is prior to another period of etching treatment of the surface of the sample in which selectivity is higher than selectivity at the one period;

wherein a duty ratio when the rf bias voltage is in the on state is set to 5 to 50%.

Please cancel claims 24-29 without prejudice or disclaimer of the subject matter thereof.

Please rewrite claim 30 in independent form as follows:

30. (amended) A method ~~according to claim 1,~~ of treating a surface of a sample, comprising the steps of:

generating a plasma in a treatment chamber;

applying an rf bias voltage of a frequency so that ions of intermediate energy which promote etching reaction while providing poor directionality are reduced, and ions of high energy having a high directionality and ions of low energy which do not contribute to etching are increased, so as to have at least one peak point at a region

of high ion energy and at least one peak point at a region of low ion energy for anisotropic etching, and the rf bias voltage to which a peak to peak voltage Vpp value larger than a Vpp value of a continuous rf bias voltage at which the same etch rate can be obtained is given, so as to have the high ion energy which is larger than a high ion energy of the continuous rf bias voltage, is applied to a stage on which a sample is placed independently of the generation of the plasma; and

on-off modulating the rf bias voltage at least at one period of an anisotropic main etch of the first layer of the sample and which prior to another period during which the second layer which underlies the first layer is exposed and in which selectivity is higher than selectivity at the one period;

wherein the at least one peak point of the region of the high ion energy and the at least one peak point of the region of the low ion energy has a number of ions which is at least twice a number of ions in a region of the intermediate ion energy.

Please add the following new claims:

--31. A method according to claim 1, wherein the sample includes a first layer formed over a second layer which underlies the first layer, and the on-off modulating of the rf bias voltage at the at least one period of anisotropic etching treatment of the surface of the sample includes an anisotropic main etch of the first layer of the sample which is prior to the another period of etching treatment of the surface of the sample during which the second layer is underlying the first layer exposed.

32. A method according to claim 31, wherein the anisotropic main etch of the first layer is effected during the at least one period without exposing the second layer which underlies the first layer.

33. A method according to claim 1, wherein the on-off modulating of the rf bias voltage is effected so that no rf bias voltage is applied during the off state.--